

FE / Applied Physics - II / F. E. - II (C.B.G.S) / 17-05-16



QP Code : 28617

(2 Hours)

[Total Marks : 60

- N.B. :** (1) Question No. 1 is compulsory.
 (2) Attempt any **three** questions from the remaining questions.
 (3) Assume suitable **data** and **symbols** if required.
 (4) **Figures** to the **right** indicate **full marks**.

1. Attempt any **five**. 15
- Why does an excessively thin film appear to be perfectly dark when illuminated by white light?
 - A grating has 620 rulings/mm & is 5.05 mm wide. What is the smallest wavelength-interval that can be resolved in the third order at $\lambda = 481 \text{ nm}$?
 - Why would you recommend use of optical fibre in communication system?
 - An electron is bound in a one dimensional potential well of width 2 \AA but of infinite height. Find its energy values in the ground state and first excited state?
 - Explain measurement of frequency of AC signal using Cathode Ray Oscilloscope?
 - Explain the term Stimulated emission & Population inversion?
 - Define superconductivity, critical temperature & critical magnetic field.
2. (a) How is Newton's ring experiment used to determine refractive index of liquid medium? 8
 The diameter of 5th dark ring in Newton's ring experiment was found to be 0.42 cm. Determine the diameter of 10th dark ring.
- (b) An optical fibre has core diameter of $6 \mu\text{m}$ and its core refractive index 1.45. 7
 The critical angle is 87° . Calculate - (i) refractive index of Cladding (ii) acceptance angle (iii) the number of modes propagating through fibre when wavelength of light is $1 \mu\text{m}$.
3. (a) With neat energy level diagram, explain principle, construction & working of Nd -YAG laser? 8
- (b) Two plane rectangular pieces of glass are in contact at one edge & are separated at the other end 10 cm away by a wire to form a wedge shaped film. When the film was illuminated by light of wavelength 6000 \AA , 10 fringes were observed per cm. Determine the diameter of the wire. 7
4. (a) Explain the experimental method to determine the wavelength of spectral line using diffraction grating? 5
- (b) Show that electron cannot pre-exist in free state in a nucleus, using uncertainty principle. 5
- (c) Distinguish between type I & type II superconductor? 5

[TURN OVER

FW-Con. 10280-16.

QP Code : 28617

2

5. (a) A diffraction grating used at normal incidence gives a yellow line ($\lambda = 6000 \text{ \AA}$) in a certain spectral order superimposed on a blue line ($\lambda = 4800 \text{ \AA}$) of next higher order if the angle of diffraction is $\sin^{-1}(3/4)$, calculate the grating element? 5
- (b) Derive one dimensional time dependent Schrodinger's equation for matter waves? 5
- (c) With neat diagram, explain construction & working of Atomic Force Microscope. 5
6. (a) Find the de Broglie wavelength of (i) an electron accelerated through a potential difference of 182 volts & (ii) 1 kg object moving with a speed of 1m/s. Comparing the results, explain why is the wave nature of matter not apparent in daily observations? 5
- (b) Derive Bethe's law for electron refraction? 5
- (c) What are Carbon Nano tubes? Explain properties of Nano tubes? 5
-